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INTEGRATION OF TECHNOLOGY IN TEACHING AND LEARNING: REPORT OF A PILOT STUDY

Presented to Al-Azhar University--Gaza

JUNE 13, 2016

AMIDEAST Leadership and Teacher Development (LTD) Program

Al-Azhar University—Gaza

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EXECUTIVE SUMMARY

Introduction

This report presents findings of a summative evaluation of a pilot initiative to promote a sustainable model of technology integration and support in pre-service teacher education courses in the Faculty of Education, Al-Azhar University—Gaza. This initiative was undertaken by a special task force formed by the Dean of the Faculty of Education of Al-Azhar University—Gaza with the approval of the Vice President of Academic Affairs, and supported by AMIDEAST's Leadership and Teacher Development (LTD) Program. The immediate purpose of the report is to investigate the feasibility of deploying Moodle as a learning management system designed to increase the integration of technology in teaching and learning in courses in the Faculty of Education. The report also presents recommendations for scaling up the sustainable and institutionalized integration of technology in courses taught in the Faculty of Education and throughout the university.

Technology and Teacher Education Task Force

In light of the university's strategic vision to integrate the use of technology in teaching and learning, the Technology and Teacher Education Task Force was formed in November 2015 and completed its work in May 2016. The Task Force was headed by Mr. Montaser Al-Halabi, technology specialist for the Faculty of Education, and included two full-time instructors, Dr. Atta Darwish and Dr. Ali Naser. Ms. Rana Sager, LTD program manager/Gaza, and Dr. Louis Cristillo, Director of LTD's Teacher Education component, served as technical advisors.

The purpose of the Task Force was to pilot a model of capacity building designed to enable a number of faculty members to integrate technology in their pre-service teacher education courses. Specifically, the Task Force accomplished four main objectives:

- Provided technical training for the use of audio visual systems installed in lecture halls.
- Conducted a series of workshops to build the knowledge and skills of the Task Force members in the theory and application of Technological Pedagogical and Content Knowledge (TPACK) to teaching and learning in higher education.[1]
- Developed and piloted a design-based model for redesigning lecture courses based on TPACK and related conceptual frameworks for integrating technology in education.
- Provided continuous professional development and technical support for five instructors who volunteered to teach courses in spring 2016 using Moodle, a digital learning management system.

Moodle Pilot Study

To investigate the experiences and perspectives of both students and instructors on the impact of using Moodle on teaching and learning, the Task Force used a mixed-methods approach to collect both quantitative and qualitative data, which included an online survey of 355 students in six courses, focus group interviews with a selection of participating students and instructors, and a comparison of

[1] Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2014). The technological pedagogical content knowledge framework. In *Handbook of research on educational communications and technology* (pp. 101-111). Springer New York.

students' semester grades for three courses that utilized Moodle in spring 2016 but not in the previous semester the year before.

Major Findings of the Study

1. For both the students and instructors alike, this was their first experience with blended learning via an online learning management system at Al-Azhar University.
2. Students and instructors generally found it easy to learn and use the basic teaching and learning tools in the Moodle application; these included multiple-attempt quizzes, video assignments, and feedback questionnaires (for individual and group responses to videos and other assignments).
3. Moodle created a blended learning environment that dramatically changed the classroom from being dominated by traditional lecturing and note taking, to one characterized by learner-centered and interactive methods for learning experiences and formative assessments.
4. Moodle supported an increase in students' communication and collaboration in a "community of learning" not only with their instructors, but also among themselves. Blended instruction allowed instructors to balance their lecturing with more interactive learning activities both during and outside the classroom sessions that helped students think more deeply about the knowledge and skills they were learning.
5. Instead of relying solely on rote memorization of lecture notes, students' study habits improved. Moodle encouraged students to engage more frequently in reviewing and thinking about what they were learning and to take more personal responsibility for actively monitoring their own progress and correcting misconceptions in their understanding.
6. The use of Moodle in their courses impressed upon the students, as well as the instructors, the added value of using technology in teaching and learning. Moodle exposed the students to tools and methods that all teachers in the 21st century should practice in classrooms to help students gain knowledge and skills to succeed in the global knowledge economy.
7. Moodle compelled the instructors to question their assumptions about course design and to plan lessons that blend conventional lecturing with digital and Internet-based interactive activities to create a more dynamic and learner-centered experience for all.
8. The use of Moodle helped good students do better and struggling students to improve. Based on a comparison of student achievement results for three courses (whose grades were available at the writing of this report) with the same courses taught a year earlier without Moodle, there was substantive improvement across the five levels of academic performance (Excellent, Very Good, Good, Passing, Failing). Impressively, the percentage of failing or passing students in the Pharmacology 3 course (**Figure 8**) declined dramatically from 34% to just 14%, in Teaching Geometry (**Figure 7**) from 38% to 29%, and in Teaching Science (**Figure 6**) from 8% to 0%.

In sum, based on the findings of the study, we can conclude that the deployment of Moodle—supported by the TPACK training workshops and continuous monitoring by the Task Force—served as a catalyst for the emergence of technology-enhanced communities of learning among students and faculty members, something that was nearly impossible to achieve previously due to large class sizes and a traditional reliance on lecturing and rote memorization. To build on this success and scale up the systematic integration of technology in teaching and learning at Al-Azhar University—Gaza, the Task Force urges the university leadership to consider implementing the following recommendations.

Recommendations

1. Establish a permanent Office for Teaching, Learning, and Technology. This unit would be comprised of a team of highly creative educators, instructional designers, and educational technologists who would work collaboratively with faculty members and students to design and implement courses that integrate technology to support active pedagogies and meaningful, learner-centered experiences in both onsite and blended instructional environments.
2. Develop an implementation plan that harmonizes and aligns the technology goals of the mission and vision of the Faculty of Education's Three-Year Strategic Plan. The plan would identify the stages, required resources and marketing strategies for the implementation of the scope of work of the Office for Teaching, Learning, and Technology.
3. Recognize and support the use of technology in both onsite and virtual forms of classroom assessment by allowing faculty members flexibility in the points they may award for mid-term and final exams.
4. Upgrade classroom and lecture halls with instructional technology such as computers, projectors, Wi-Fi access, and interactive whiteboards.
5. Provide advanced training in educational technology and instructional design for the members of the Technology and Teacher Education Task Force.
6. Authorize and provide resources for the development and implementation of basic and intermediate Moodle training courses for all interested faculty members and students across the university.
7. Develop online training manuals and resources for faculty members and students on the use of Moodle and other educational technology tools.

INTRODUCTION

The primary aim of this report is to present findings of a summative evaluation of a pilot initiative to promote a sustainable model of technology integration and support in pre-service teacher education courses in the Faculty of Education, Al-Azhar University—Gaza. A second purpose is to report on the work of an interim committee—the Technology and Teacher Education Task Force—created to support the technology goals outlined in the Three-Year Strategic Plan of the Faculty of Education in cooperation with the LTD. A third specific aim is to provide evidence for the feasibility of deploying Moodle as a learning management system designed to increase the integration of technology in teaching and learning in courses of the Faculty of Education and in other departments where students from the Faculty of Education are cross-registered. Finally, the report presents recommendations for scaling up the sustainable and institutionalized integration of technology in courses taught in the Faculty of Education and throughout the university.

Technology Goals in the Three-Year Strategic Plan (SP)

There are three areas in the Three-Year Strategic Plan in which technology integration is a major goal. The infusion of technology figures centrally in the Vision Statement of the Plan and is mandated in two key strategic goals.

> **"Vision:** The Faculty of Education aspires to create an active learning environment where classrooms and learning labs are equipped with the latest audio-visual teaching equipment and methods; where faculty members are superbly competent in offering a variety of academic programs that respond to local and regional needs in accordance with international standards for high quality pre-service teacher education; where graduating students will have the knowledge, values, skills, creativity and confidence to enter the teaching profession ready to teach and promote social justice and equality; and where the Faculty of Education will ceaselessly strive to make its programs the finest and most competitive.
>
> "The highest priorities proposed for the next three years are to enhance faculty excellence; increase experiential learning across our programs; revise the undergraduate curriculum so that students have more opportunities to transfer their learning to authentic classroom practice; and provide well-equipped facilities to harness the most effective education technologies toward advancing our teaching and research."
>
> **Strategic Goals**: Five strategic objectives will guide our collective efforts:
>
> 1. Establish an effective learning environment. Sub-goal: *Upgrade technology infrastructure in lecture halls.*
> 2. Develop the quality of academic programs
> 3. Enhance the professional growth for academic and administrative staff. Sub-goal: *Build the capacity of instructors to gain the necessary knowledge and skills to make effective use of technology*
> 4. Enhance academic and action research
> 5. Promote community service

Implementation of Technology Objectives

With in-kind assistance from AMIDEAST/LTD, the Faculty of Education converted three lecture halls into "smart" classroom. This effort supported the Strategic Plan's goal of upgrading the technology

infrastructure in lecture halls. In order to pave the way toward the successful implementation of the two sub-goals highlighted above, the Dean of the Faculty of Education formed a special committee to pilot a system for the effective technical and pedagogical integration of technology in the university classroom.

TECHNOLOGY AND TEACHER EDUCATION TASK FORCE

Structure, Goals, Objectives

The idea for the Technology and Teacher Education Task Force is grounded in the strong focus in the Three-Year Strategic Plan on upgrading the technology infrastructure in three lecture halls and a teacher training lab, plus the need to build the capacity of instructors to gain the necessary knowledge, skills, and support to make effective use of technology in their courses. To accomplish these goals, the Faculty of Education recognized the need to build the capacity of instructors in the theory and practice of technology integration in higher education.

In light of the university's strategic interest in integrating the use of technology in teaching and learning, the Technology and Teacher Education Task Force was formed in November 2015 by the Dean of the Faculty of Education and approved by the Vice President of Academic Affairs. The Task Force completed its work in May 2016. The purpose of the Task Force was to pilot a model of capacity building designed to enable a number of faculty members to integrate technology in their pre-service teacher education courses. To achieve this goal the following objectives were identified:

- Provide technical training for the use of audio visual systems installed in lecture halls.
- Build the knowledge base of the Task Force in the theory and application of Technological Pedagogical and Content Knowledge (TPACK) to teaching and learning in higher education.
- Develop and pilot a design-based research model for redesigning lecture courses based on TPACK and related conceptual frameworks for integrating technology in education.
- Provide continuous professional development and technical support for at least two instructors to teach courses in spring 2016 using Moodle, a digital learning management system.

The membership of the team included Mr. Montaser Al-Halabi, technology specialist for the Faculty of Education, and two full-time instructors from the Department of Curriculum and Teaching appointed by the Dean, Dr. Atta Darwish and Dr. Ali Naser. These faculty members were responsible for learning how to apply the TPACK framework toward integrating technology into their courses in pedagogically sound ways. This capacity building experience was expected to enable them afterwards to mentor other instructors wishing to infuse technology into their courses. Representing LTD, Ms. Rana Sager, LTD program manager/Gaza, and Dr. Louis Cristillo, Director of LTD's Teacher Education component, served as technical advisors.

Montaser served as the team's coordinator and answered to the Dean. His chief responsibility was to provide expertise, training and guidance in the selection and integration of ICT hardware and software for two pilot courses in spring 2016 to be taught by Dr. Atta and Dr. Naser.

Table 1. Timeline of Task Force activities

	Nov '15	Dec '15	Jan '16	Feb '16	March '16	April '16	May '16
Establish Tech-Ed Task Force							
TPACK Workshops							
Moodle Workshops							
Moodle Pilot							
Moodle Evaluation Study							
Report							

TPACK workshops

Eight workshops were convened with the participation of Mr. Montaser, Dr. Ali Naser, and Dr. Atta Darwish, and with Rana Sager and Lou Cristillo: three in November and five in December 2016. By the end of the workshops, the members of the Task Force were able to: use Google Docs to collaborate remotely; use the principles of "Backward Design" to analyze the major goals and intended learning outcomes of a course syllabus; apply ISTE standards for students to plan digitally enhanced learning experiences and assessment activities; use both the TPACK and SAMR frameworks to develop technology-infused learning and assessment activities to increase students active learning in the "4Cs" (communication, collaboration, critical thinking, and creativity); and, build course content and perform basic teacher functions using Moodle. **Annex A** provides a detailed listing of the dates and goals for each workshop.

The immediate goal of the workshops was to provide the two instructors on the Task Force with sufficient technological and pedagogical knowledge and skills to effectively infuse technology into courses they would teach in the spring 2016 semester. The long-term goal—should the university decide to scale up the integration of educational technology in its courses (see recommendations, below)—was to train a core group of faculty mentors who, with technical support from a team of technology specialists, to support other instructors eager to integrate technology into their courses.

Moodle Workshops

The TPACK workshops were a means to an end in that they were designed to prepare the instructors to pilot the use Moodle, an open-source learning management system (LMS), in order to create a blended learning experience for students in two courses taught by Dr. Naser (Methods of Teaching Geometry) and by Dr. Atta (Methods of Teaching Science) during the spring 2016 semester.

When the spring semester was about the start, three other instructors heard about the Moodle pilot program and volunteered to participate: Dr. Sumer Abou Shaaban (Methods of Teaching English); Dr. Mazen Saqqa (Pharmacology); and Dr. Ali Abuzaid (Statistics). So, instead just two courses to pilot Moodle, the Task Force was fortunate now to have a total of six. (One of the instructors, Dr. Mazen Saqqa, used Moodle to teach two separate pharmacology courses.)

To ensure that both students and their instructors understood how to navigate Moodle's user interface, Mr. Montaser developed and delivered orientation sessions for students inside their classrooms at the start of the semester. He also provided on-demand training and coaching for the instructors throughout the semester; these sessions addressed both the technology and pedagogical needs of instructors.

- **Student Orientation:** Four orientation workshops for students enrolled in the courses taught by the two Task Force instructors—Dr. Ali Naser and Dr. Atta Darwish were conducted in classrooms at the start of the spring semester 2016.
- **Training Workshops:** Individual workshops and tutorials for instructors comprised 12 sessions with Dr. Ali Naser; 12 sessions with Dr. Atta Darwish; 3 sessions with Dr. Mazen Saqqa ; 3 sessions with Dr. Sumer; and 3 sessions with Dr. Ali Abu Zaid.
- **On-demand Support**: Additionally, Montaser provide continuous technical support with the instructors by phone and through in-person visits in his office throughout the semester.

MOODLE EVALUATION STUDY

Purpose and Methods: To investigate the perspectives of both students and instructors on the impact of using Moodle on teaching and learning, the Task Force used a mixed-methods approach to collect both quantitative and qualitative data. Quantitative data were collected using an online survey, and a comparison of students' semester grades was examined for three courses that utilized Moodle in spring 2016 but not in the previous semester, 2015. The comparison courses included those taught by the two members of the Task Force, Dr. Naser (Methods of Teaching Geometry) and Dr. Atta (Methods of Teaching Science), and by Dr. Mazen Saqqa (Pharmacology). Additionally, three focus groups with students and instructors generated qualitative data that provided in-depth narrative explanations about the perspectives of the students and instructions on using Moodle for the first time in their courses.

Survey and Focus Group Questions: The survey questions were grouped into three sections. The first section assesses the user's previous familiarity or exposure to Moodle. The second section asks the users to evaluate the ease with which they were able to use and navigate course tools and functions. The third section asks the users to evaluate the extent that Moodle enhanced their learning experiences and allowed them to achieve the goals of the course. These questions were ostensibly the same for both students and instructors, with each group responding from the particular perspective of their user experience. The focus group questions primarily explored the users' perceptions of the value that Moodle added to the teaching and learning experiences in the courses, particularly with regard to the extent they believed that Moodle enhanced students' engagement with course content both inside and outside the classroom context. (See **Annex B** and **Annex C** for the complete list of survey and focus group questions.)

Research Population: In all, there were 755 students enrolled in six courses taught by five teachers using Moodle. As seen in **Table 1**, 355 students completed the survey, a return rate of 47%. Each of the professors completed a survey for the course he/she taught using Moodle.

The focus group interviews comprised two focus groups of 10 students total—four males and six females—and a group interview with the three instructors, two of whom were members of the Task Force—Dr. Ali Nasser and Dr. Atta Darwish, and the third was from the Faculty of Pharmacology, Dr. Mazen Saqqa .

Table 2. Online Survey of Students

Course	Student Enrollment	Completed Survey	
Methods of Teaching English	120	64	53%
Principles of Statistics	314	93	30%
Pharmacology 1	107	56	52%
Pharmacology 3	92	45	49%
Methods of Teaching Science	22	21	95%
Methods of Teaching Math 2	100	76	76%
Totals	755	355	47%

Results and Discussion

Part 1: Previous experience with Moodle

From both the survey and interview results, nearly all of the students (92.7%, **Table 2**) had never used Moodle before. Two of the five instructors had some past experience, but this was more than eight years prior and at a different university. Most students (83.4%) received an orientation about using Moodle at the start of the spring 2016 semester (delivered by Mr. Montaser), and of these 71.6% found the orientation helpful. The five instructors all agree that the orientation was sufficient to get them started.

Table 3. Prior Use of Moodle among students

		Count	N %
QA1: Is this your first time using Moodle in a course?	No	26	7.3%
	Yes	329	92.7%
QA2: Did you receive an orientation to Moodle either before or at the start of your course?	No	59	16.6%
	Yes	296	83.4%
QA3: If you received an orientation to Moodle, do you feel it was adequate?	No	84	28.4%
	Yes	212	71.6%

In the focus groups most of the students reported that they had never had a course before at Al-Azhar University—Gaza that incorporated online or blended learning methods. A few said they had taken a physics course from an instructor who "flipped" the classroom by having students watch content-related videos outside of class. Some noted that a few instructors had tried to incorporate online tools such as Google Hangout, but discontinued their use mainly due to electricity outages. In sum, for both the students and instructors alike, this was their first experience with blended learning in a course for the full duration of a semester.

Part 2: Ease of using and navigating Moodle's course tools and functions

The survey asked the students and instructors to assess how easy or difficult it was for them to use or navigate eight of Moodle's most commonly used tools and activities. **Figure 1** ranks the students' responses from easy to difficult. Most of the students (82%) found six of the eight items easy to use. The two that seemed difficult included "uploading of files" (31% of students) and the "discussion forum" (39% of students). The instructors (**Table 3,** above) found few difficulties using the tools; however, two of the five found using the discussion forum somewhat difficult, and two had some difficulty grading of open-ended questions.

In the focus groups, the students said they found the Moodle's affordance of multiple-attempt quizzes, access to extra materials and learning resources, and questionnaires (for feedback) to be easy to use and, more importantly, extremely beneficial to their learning experiences in the courses.

The instructors credited the tech support they received from Mr. Montaser in making their use of Moodle's basic functions so easy. They expressed the desire for the university to make available additional workshops in the near future to help them learn advanced features of the software.

Even though Moodle workshops provided the instructors with just the basics, one of the instructors, Dr. Atta Darwish, went beyond the basics and, with coaching from Mr. Montaser, used Moodle to create an advanced assessment activity in which students videoed a micro-teaching lesson that they and their classmates then annotated with comments and feedback. This activity, explained Dr. Atta, created a collaborative learning experience like none they had experienced before. This is a good example of what the SAMR approach would call task "modification," whereby digital tools allow educators to redesign an otherwise conventional task (in this case, peer-observation) and increase students' collaboration in the construction of knowledge.

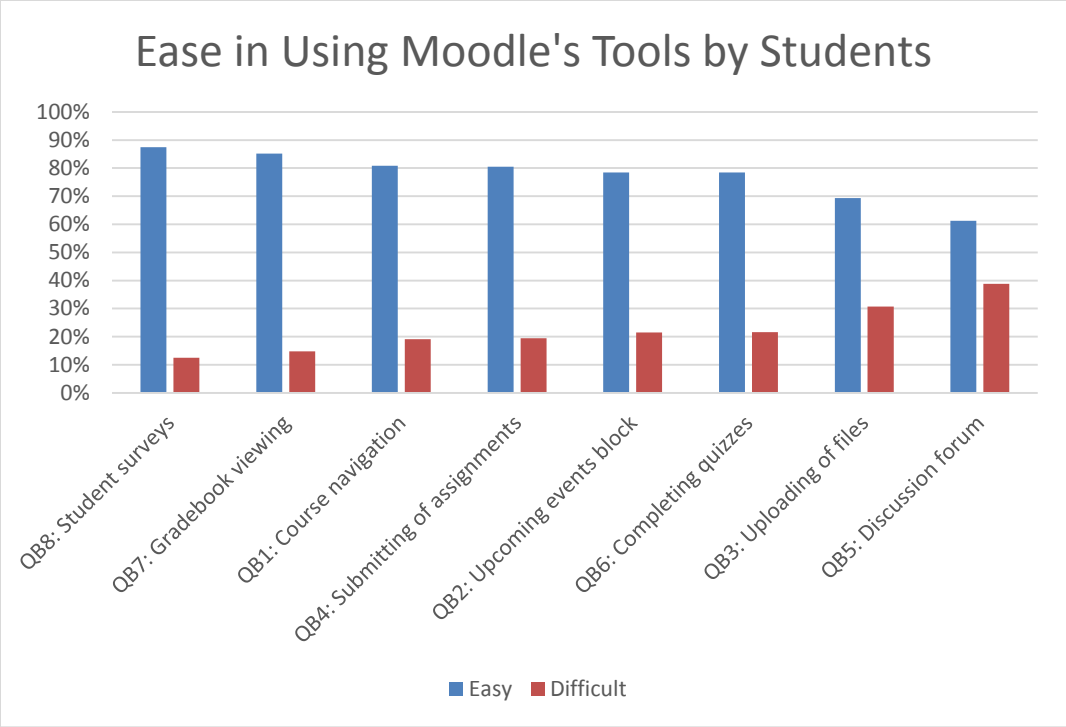

Figure 1. Ease of use by students

Table 4. Ease of use by instructors

	Yes	No
QA1: Is this your first time using Moodle to teach a course?	3	2
QA3: Did you receive an orientation to Moodle before starting your course?	5	0
QA4: If you received an orientation to Moodle, do you feel it was adequate for your needs?	5	0
	Agree	**Disagree**
QC1: I had no problem using Moodle technology in my course.	4	1
QC2: I can easily organize and arrange the order of content and activities for each week.	5	0

Part 3: The extent that Moodle enhanced teaching/learning experiences and allowed students to achieve the goals of the course.

The questions in this part of the survey are divided in four themes: (1) the extent that Moodle facilitated completing assignments; (2) the extent that Moodle enhanced communication for learning among students and instructor; (3) the extent that Moodle improved students' learning experiences; and, (4) the extent that students/instructors value Moodle as a learning tool. These same four questions framed the core questions in the focus group interviews (Appendix C).

(1) The extent that Moodle facilitated completing assignments

Well over two-thirds of the students surveyed (68%) agreed they found it easy to use Moodle technology (68%) to complete assignments (67%) and follow up on (69%) their work and learning activities (**Figure 2**). In the focus groups, the students explained that compared to other courses, Moodle kept them more engaged with the course content outside of class. They explained that this was because Moodle made it easy for them to access and review lectures and quizzes throughout the week. As one student commented:

"It has become part of our habit to open Moodle on a daily basis, and this has made learning more fun because we become engaged with the content."

Another student added:

"Even though our subject is difficult, Moodle has made it easier because we are more engaged in the content and in understanding the content."

In the group interview, the teachers observed that Moodle made it easier for them to follow up with students' weekly progress and to identify areas that students needed extra help in. They credited Moodle for allowing them use quizzes frequently as a formative assessment strategy that encouraged students to reflect more critically on their learning and understanding. One instructor, Dr. Atta Darwish, commented:

"Moodle improved my teaching methodology and allowed me to become more aware of how to prepare quizzes and use new teaching methodologies that I didn't use before. For the first time since I started teaching, I have never prepared 12 quizzes in one semester as I did this semester!"

In sum, Moodle created a blended learning environment that did more than help students to simply "complete" assignments. On the contrary, the data indicate that Moodle dramatically shifted the attention of both teachers and students from focusing narrowly on episodic lecturing and note taking, to paying more attention to both the accessibility and quality of how course content is delivered, learned, and assessed.

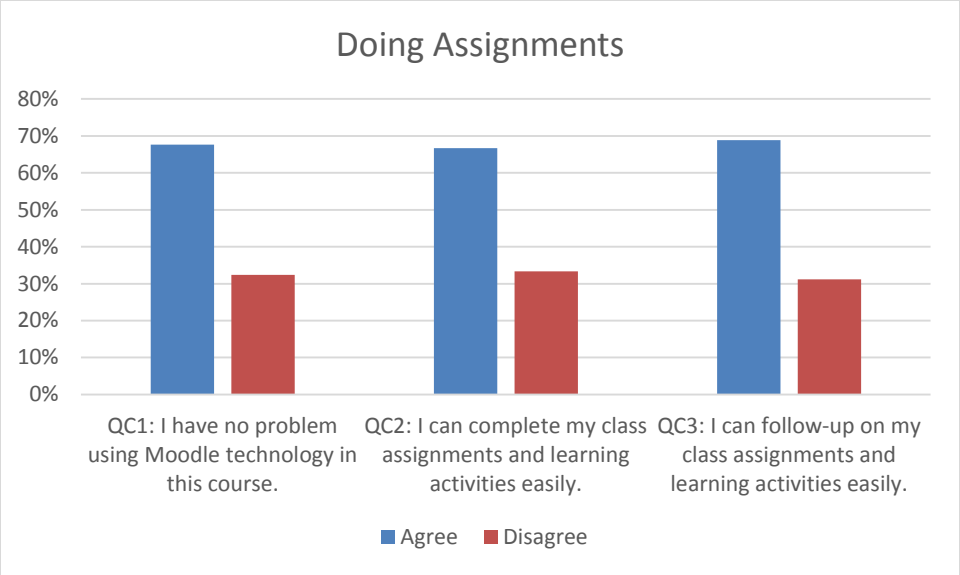

Figure 2. Ease of using Moodle in doing assignments

(2) The extent that Moodle enhanced communication for learning among students and instructor

One of the major reasons that higher education institutions adopt online learning management systems like Moodle is to increase students' communication and collaboration. **Figure 3** shows that although students were split in their opinion about Moodle improving communication among their classmates (48% agree vs. 52% disagree), two-thirds (65%) agreed that communication with their instructor improved and, importantly, nearly three-quarters agreed (73%) that Moodle made them feel part of a learning community.

In the focus group, students explained that Moodle boosted their learning performance by allowing them to exchange ideas and information and to ask questions and compare answers, and even help one another troubleshoot technical problems. In particular, the students commented that Moodle enabled them to deepen their learning and understanding by facilitating communication with their instructors.

In particular, the students credited the instant feedback function of Moodle quizzes for increasing their self-confidence in taking more responsibility for their own learning. As one student observed:

"Moodle helped us to ask our instructors more questions about difficult questions we faced in the quizzes, which helped in learning the content more deeply."

Another student spoke of her increased willingness to communicate with the instructor:

"It helped me to become more confident in asking my instructor. In the classroom, I used to be shy about asking questions, but after using Moodle and looking at the content and questions, I became more confident to ask my instructor."

These same sentiments were echoed in the survey results among the instructors. All five of the instructors agreed that Moodle improved their communication with their students as well as among their students; furthermore, they agreed that as instructors Moodle made them feel part of a learning community with their students.

In the focus group interviews, the instructors commented that compared to other courses, Moodle increased the quality of interaction and collaboration among their students, noting in particular that they observed students were exchanging ideas and feedback more than ever before. Moreover, they credited Moodle with increasing their interaction with their students; as one instructor commented:

"Moodle encouraged [my students] to ask more questions and learn more [instead of waiting until the] the end of semester."

Importantly, the instructors attributed Moodle's communication tools in helping them overcome the perennial problem of low teacher-student interaction in classes with large enrollment:

"[Despite] the large classroom size, Moodle helped my students to interact more with me and to follow up on their progress through Moodle and give them immediate feedback."

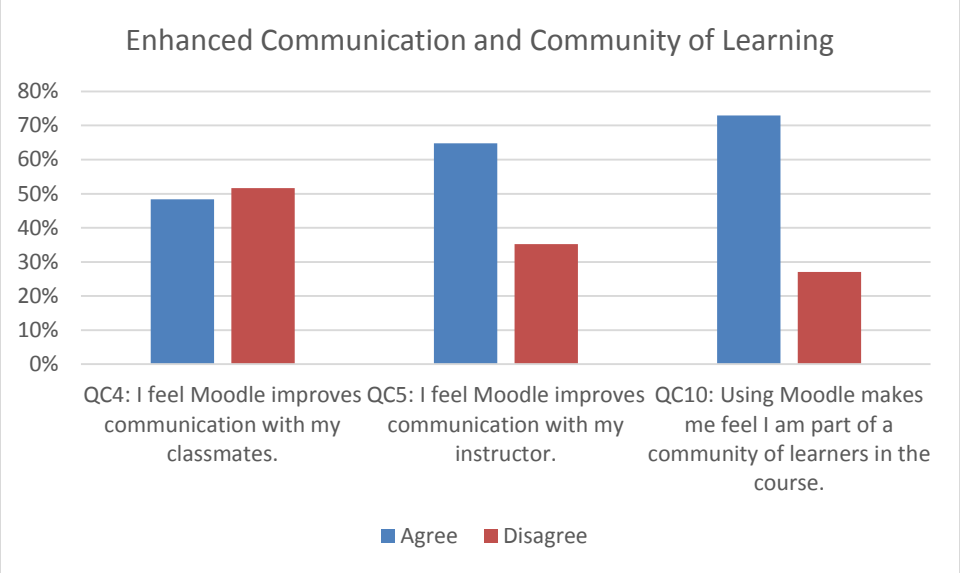

Figure 3. Enhancement of communication in the learning process

In sum, the data strongly indicate that Moodle was a catalyst for an increase in students' communication and collaboration not only with their instructors, but also among themselves. This finding validates the perception by both teachers and students that they were part of a community of learning, where instructors relied more on facilitating active learning than simply lecturing to "transfer" knowledge to students, and where students engaged more frequently and interactively in learning experiences that helped them think more deeply about the knowledge and skills they were learning.

This conclusion is valid despite the fact that the survey results showed about only half the students (48%) agreed that Moodle improved communication with their classmates (**Figure 1, above**). We say this because even though there was no baseline to compare past levels of communication, the interviews with both students and teachers strongly suggests that 48% likely represents a big improvement from previous levels of student interaction and communication in the same courses. Furthermore, the instructors admitted that they did not use the discussion forum tool in Moodle as much as they would have liked, which is reflected in the results shown in Figure 1, where 38% of the students said using the tool as "difficult." A more plausible explanation for this, which in fact the Task Force members themselves agreed on, is not that using the discussion tool was "difficult" technically speaking; rather, the instructors themselves did not have the pedagogical knowledge or experience needed for utilizing the discussion forum effectively. This is a skill that needs further development among the instructors in future workshops on the advanced uses of Moodle.

(3) The extent that Moodle improved students' learning experiences

Figure 4 shows the overwhelming agreement among nearly three-quarters of the students (71%) who report that Moodle enhanced their learning experiences, resulting in improved study habits (68%) and more time spent on studying (61%) which, they report, has improved their learning (75%). Impressively, some 85% of the students agreed that doing multiple attempts for a quiz—a special feature in Moodle's quiz settings—improved their understanding of course content.

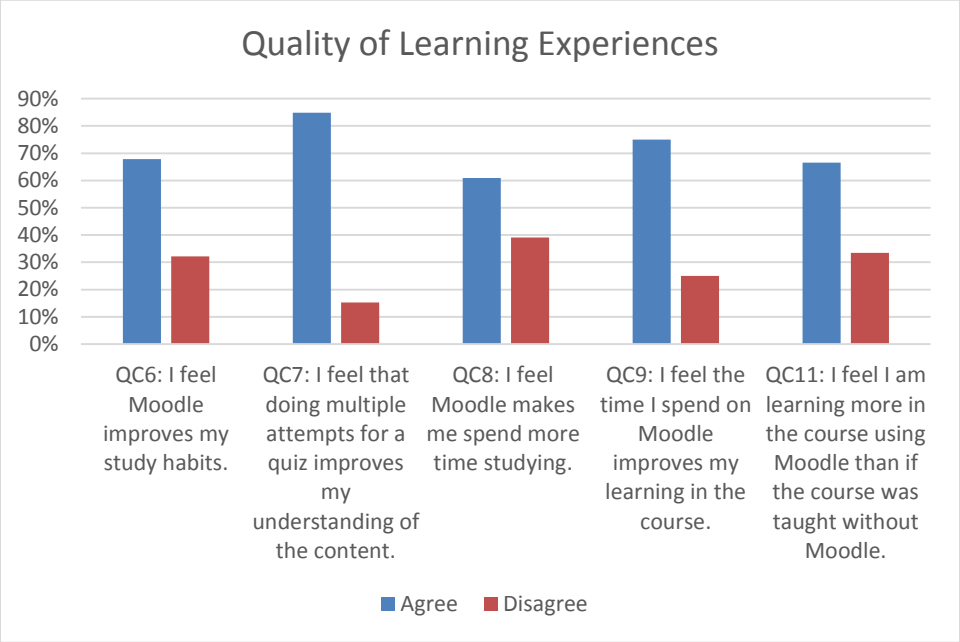

Figure 4. Quality of learning experiences

These results are validated by students' opinions voiced in the focus groups. Asked whether spending more time studying worth it, one student summed up the opinion of others in the interview:

"Moodle helped us to study continuously throughout the semester and not just before the mid-term and final exams."

Furthermore, the students described how Moodle encouraged them to take more responsibility for their own learning, saying that the easy access to course resources and information allowed them to monitor their own progress and even look ahead and explore upcoming topics or issues in advance of a lesson.

Of all the Moodle features they used, the students unanimously said that they valued Moodle's quizzes that permit immediate feedback and multiple attempts. This feature was, in fact, the most commonly used tool that the instructors used. The main benefit is that rather than being used as a one-time summative activity for a grade, the multiple-attempt setting for the quiz allows students to identify misconceptions or mistakes and then take action to correct them, as one student explained:

"In the first attempt, I didn't understand the questions of the quiz. Before I took the second attempt, I went back to the textbook and reviewed the lesson and I challenged myself to do better in the second attempt and I succeeded. We now search for information and other sources to discuss without instructor."

All five of the instructors reported on the survey that they agreed that Moodle improved their students' study habits and helped them learn more in their courses compared to courses without Moodle. One instructor attributed these improvements to the fact that Moodle enabled him to create a larger number of learning activities by which to engage students outside of class time on a weekly basis.

At the time when the survey was administered, it was still too early in the semester to make any judgments on whether Moodle was contributing to improvements in students' academic achievement. Even so, the instructors said in the focus group that they heard students commenting that their academic performance was better. This perception was validated by students who remarked in focus groups that they expected to see improvement in their academic performance, as one student explained:

"We felt more comfortable and confident going into the mid-term exam."

Coincidentally, just shortly after the mid-term exams—when the focus groups were conducted—Dr. Mazen Saqqa validated this student's confidence by reporting that he saw a robust improvement in his students' mid-term scores in pharmacology:

"The failing percentage decreased and the percentage of passing increased, and I believe this is due to Moodle since students have been engaged with course content on a weekly basis."

Dr. Mazen's statement was validated at the end of the semester when final course grades in several courses, including his, showed marked improvements in student achievement compared to the previous semester when the same courses were taught without Moodle. (See page 18 for details).

In sum, the evidence from both students and instructors leads to the irrefutable conclusion that the introduction of Moodle, even at the basic level of productivity, contributed to improvements in students' learning experiences. Instead of relying solely on rote memorization of lecture notes, students' study habits improved. We see evidence of less cramming at the last minute before a test and more frequent and regular reviewing and thinking about what is being learned, and less passivity towards assignments and more personal responsibility for actively monitoring one's own progress. These changes are indicative of the positive changes in the entire learning environment of the classroom, and not limited to just study habits, as the next section will demonstrate.

(4) The extent that students/instructors value Moodle as a learning tool

The vast majority of students (85%) agreed that using Moodle in their coursework made them see the importance of using technology in teaching and learning, even though they were split evenly (50%) on whether they would like to see Moodle used in all of their courses.

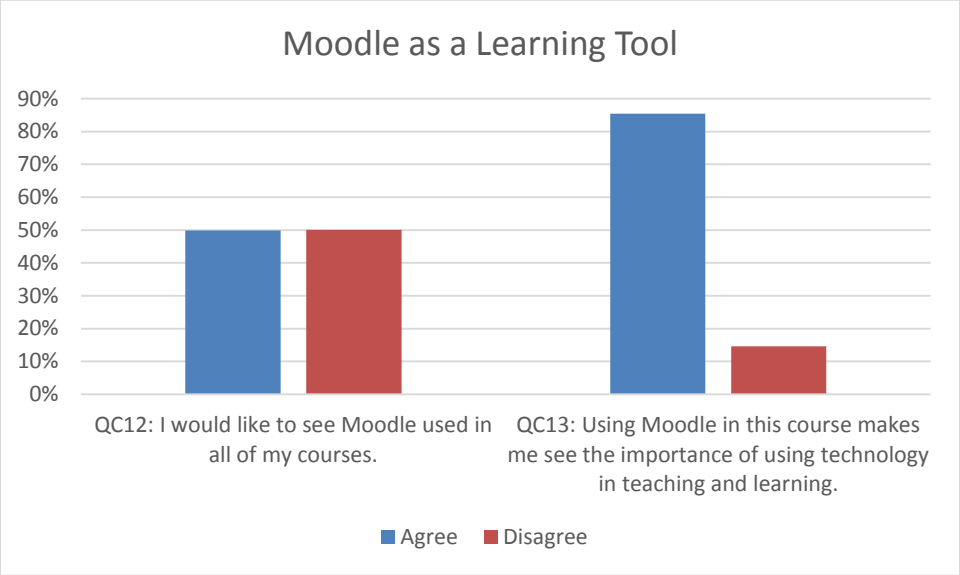

Figure 5. Moodle as a learning tool

In the focus groups, students welcomed the differences they saw in the teaching practices of their instructors as a result of Moodle. They observed that unlike other instructors who mainly lecture from a textbook, Moodle enhanced their instructors' capacity to make a lecture course more interesting and engaging, for example, through the addition of videos linked to online discussions, multiple-attempt quizzes, and the use of a Smartboard. Some students found this blended learning environment to be inspiring, as one student explained:

"Now we feel we can use the blended learning approach in our future teaching methods when we become teachers one day. We feel that we are now more confident in integrating technology in our own teaching."

Another student remarked:

"The instructor became a role model for us and now we feel that we have learned new ways of teaching methods that we can use in writing quizzes, asking questions, and other uses of technology."

These sentiments are validated by the views offered by the instructors on the survey and in the focus group. Four of the five instructors on the survey indicated that using Moodle changed how they approach the planning of their lessons and contributed to their professional development in the use of technology in teaching and learning. All agreed they would like to use Moodle in other courses they teach. During the focus group interview, they explained that using Moodle helped them put the learning needs of students more at the center of how they design a syllabus and plan learning and assessment activities to get students more engaged with the content.

Dr. Atta Darwish summed up the view of his colleagues:

"I am now more systematic in the way I prepare for this course. I am more aware of the desired outcomes of the students and use Moodle to select the appropriate input to help students to reach the outputs. Moodle helped me to become more organized and prepared in advance in my course design."

His colleague, Dr. Ali Naser added:

"In the past, we only prepared for our course using the textbook, and relied on lecturing and few videos; but now we vary in our teaching resources, methods and assessments. Our follow-up and student monitoring has increased due to Moodle."

In sum, both instructors and students found Moodle to be more than a novel learning tool. For instructors, Moodle compelled them to think more creatively about how to blend conventional lecturing with digital-based interactive activities, resulting in a more dynamic and learner-centered environment in the classroom. For students, the new experience of learning in a blended learning environment exposed them to active learning activities—both inside and outside the classroom—that are typically absent in a conventional lecture course. Furthermore, as per-service teachers, the students were exposed to a sampling of tools and methods that teachers in the 21st century are expected to practice in classrooms so that learners are prepared to participate and succeed in the global knowledge economy.

Part 4: Student Achievement

Student achievement in three Moodle-enhanced courses that ended in May 2016 were compared with results from the same courses offered in the previous spring semester in May 2015. The results shown in **Figure 6**, **Figure 7**, and **Figure 8** indicate marked improvement in academic achievement in all three cases. Impressively, the percentage of failing or passing students in the Pharmacology course (**Figure 8)**

declined dramatically from 34% to just 14%, in Teaching Geometry (**Figure 7**) from 38% to 29%, and in Teaching Science (**Figure 6**) from 8% to 0%.

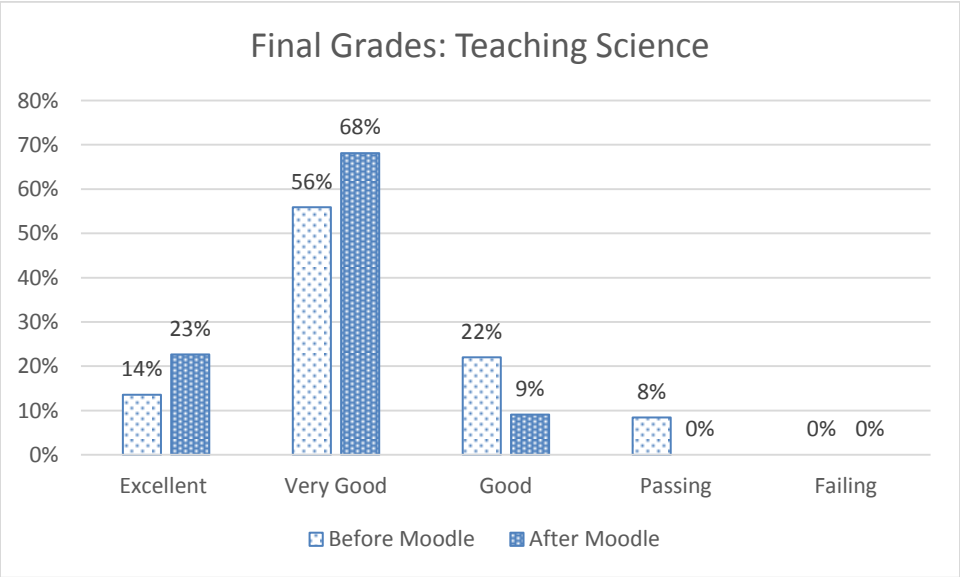

Figure 6. Student achievement results, Teaching Science

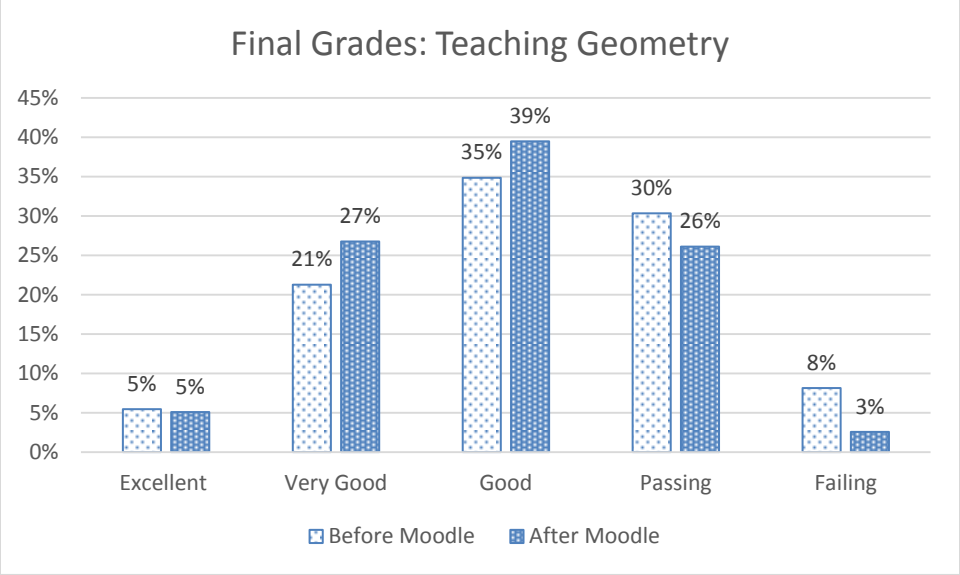

Figure 7. Student achievement results, Teaching Geometry

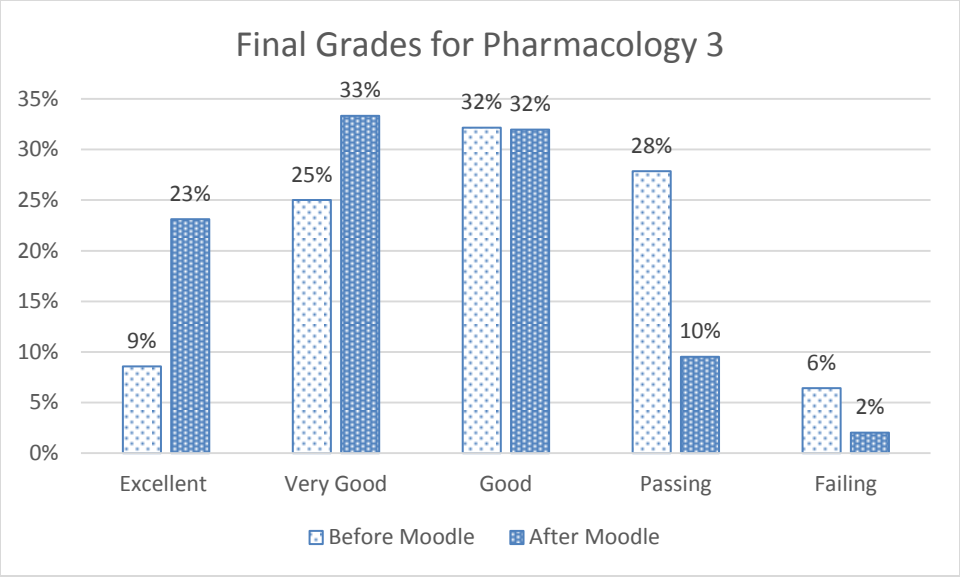

Figure 8. Student achievement results, Pharmacology 3

Based on the other evidence presented in this report, an important conclusion we can draw from these results is that the addition of Moodle helped good students do better and struggling students to improve. Notably, in each course the percentage of either "failing" or "passing" students declined, and this is important for two reasons. Firstly, Moodle's assignment tools allow students to monitor and instantly obtain information—feedback—about their progress at any point during a course, enabling them to identify and correct misconceptions or weaknesses and take action to improve. Secondly, instructors can use Moodle's reporting features to instantly collect data on the progress of the entire class or about specific students and quickly diagnose problem areas, and then fine tune their teaching practices to improve student leaning. And this can be easily done for any course regardless of the number of students enrolled, whether it's just 20 students or 200 or more. In sum, Moodle powerfully enhances the capacity of instructors to address the collective or individual needs of students, particularly for those who need extra learning support.

CONCLUSIONS AND RECOMMENDATIONS

The evidence of improved student achievement is but one of the many indicators shared in this report that demonstrate the benefits of integrating technology in classrooms and curriculum at Al-Azhar University—Gaza. The deployment of Moodle served as a catalyst for the emergence of communities of learning among students and faculty members, something that was nearly impossible to achieve previously due to large class sizes and the heavy reliance on lecturing and rote memorization. Instructors found that using a blended learning approach with Moodle helped them to question their assumptions about course design and to move away from a teacher-centered model of classical lecturing to a learner-centered approach characterized by active learning rather than passive memorization. Students benefited on multiple levels. Individually, they were able monitor and reflect on their learning progress more routinely than ever before. By using Moodle to work cooperatively outside of class meeting times, students were also able to share and exchange information and knowledge more easily and independently than before.

In order to build on this success and scale up the systematic integration of technology in teaching and learning at Al-Azhar University—Gaza, the Task Force urges the university leadership to consider adopting the following recommendations:

1. Establish a permanent Office for Teaching, Learning, and Technology. This unit would be comprised of a team of highly creative educators, instructional designers, and educational technologists who would work collaboratively with faculty members and students to design and implement courses that integrate technology to support active pedagogies and meaningful, learner-centered experiences in both onsite and blended instructional environments.
2. Develop an implementation plan that harmonizes and aligns the technology goals of the mission and vision of the Faculty of Education's Three-Year Strategic Plan. The plan would identify the stages, required resources and marketing strategies for the implementation of the scope of work of the Office for Teaching, Learning, and Technology.
3. Recognize and support the use of technology in both onsite and virtual forms of classroom assessment by allowing faculty members flexibility in the points they may award for mid-term and final exams.
4. Upgrade classroom and lecture halls with instructional technology such as computers, projectors, Wi-Fi access, and interactive whiteboards.
5. Provide advanced training in educational technology and instructional design for the members of the Technology and Teacher Education Task Force.
6. Authorize and provide resources for the development and implementation of basic and intermediate Moodle training courses for all interested faculty members and students across the university.
7. Develop online training manuals and resources for faculty members and students on the use of Moodle and other educational technology tools.

ANNEX A: TPACK WORKSHOPS

Work-shop	Date	Goal	Results
1	16 Nov '15	• Understand the purpose, goals, and time frame for the Technology and Teacher Education Task Force (Tech-Ed Task Force) • Introduce the theory of TPACK and consider design research methodology as a model for integrating technology into a course syllabus.	• Developed Terms of Reference for Task Force and agreed on ground rules for teamwork. • Drafted a timeline for task completion. • Set up a shared folder on Google Drive for collaboration and archiving artifacts produced by the team.
2	18 Nov '15	• Select and review the syllabus of a spring course to be redesigned using TPACK model. • Review "Backward Design" process for unit design.	• Selected and reviewed the learning goals, content, and assessments of a syllabus for a course to be taught in the forthcoming spring semester (methods of teaching geometry). • Used a modified "UbD" (*Understanding by Design* by Wiggins and McTighe) unit-design template to analyze and evaluate the learning outcomes syllabus.
3	22 Nov '15	• Use the "UbD" unit design template to critically analyze the existing assessment methods in the selected course syllabus and consider improving them using technology. • Understand the major indicators in the technology standards for teachers and students produced by the International Society for Technology in Education (ISTE)	• Began an evaluation of assessment activities in the methods course for teaching geometry, and improved the alignment of assessment activities and the course learning outcomes. • Applied the ISTE standards for students to generate creative ideas for using digital technology to enhance the assessment activities.
4	1 Dec '15	• Use the UbD template to evaluate the alignment of learning activities and assessments with the intended learning outcomes in units comprising the first half of the course on teaching geometry. • Use the TPACK principles and ISTE standards to select and integrate technology in learning and assessment activities for particular units of study.	• Revised learning activities and formative assessments for half the units in the teaching geometry course. • Selected and integrated technology tools to help students use technology to learn content and demonstrate their understanding.
5	9-10 Dec	• Revise the course description for the teaching	• Completed the revision of

	'15	geometry course to reflect the changes made by the Tech-Ed Task Force to its learning outcomes, big ideas, essential questions, and assessments. • Evaluate the major assessment activities for second half of the teaching geometry course and plan where to integrate technology. • Introduce a Moodle the basic features and tools of a Moodle course shell. • Select a second course to be the object of technology integration by the Tech-Ed Task Force. • Introduce the SAMR model of technology integration in teaching and learning.	the course description for the teaching geometry course and integrated suggested technology into learning activities and assessments for the units comprising the second half of the course. • Identified and reviewed the syllabus of a second course—methods in teaching science—to be infused with educational technology. • Viewed a video about the SAMR approach to technology integration and considered how to apply the model in courses at Al-Azhar University—Gaza to help students develop competency in the 4Cs (communication, collaboration, critical thinking, and creativity.)
6	17 Dec '15	• Examine the Moodle course shell and evaluate the available tools and resources in the context of integrating technology into pre-service teacher education course. • Analyze and evaluate the alignment of goals, curriculum content, learning activities, and assessments comprising the syllabus for the teaching science course.	• Review Moodle course shell—plusses and minuses • Analyzed one unit of instruction from the teaching science course syllabus and evaluated the alignment of its goals and activities with the major learning outcomes of the course. • Assessed the unit's learning activities against the ISTE standards for students.
7	21 Dec '15	• Review and apply the GRASPS model for designing project-based assessments infused with technology.[2] • Continue revising the major learning and assessment activities in the syllabus for the course on teaching science and use the SAMR model to generate ideas for the suitable integration of technology.	• Used both the SAMR model and the GRASPS template to plan the integration of technology into major performance assessments in the syllabi of both methods courses: teaching geometry and teaching science.
8	30 Dec '15	• Present and share feedback of draft performance	• Shared feedback and revised

[2] The acronym GRASPS stands for Goal-Role-Audience-Situation-Product-Standards and is used for constructing performance assessment tasks. It was developed by Wiggins and McTighe for their book, *Understanding by Design,* published by ASCD (2005).

		assessments based on GRASPS method. • Become familiar with the editing function in Moodle and the range of "activity" tools available to choose from. • Learn how to select and create a learning activity from the menu of activities in Moodle.	the design of key performance assessments in the course syllabi. • Created quizzes and discussion forums for weeks 1 and 2 inside the Moodle shells of the two courses.

ANNEX B: SURVEY QUESTIONS

Section 1

Q1: Is this your first time using Moodle in a course?

Q2: Did you receive an orientation to Moodle either before or at the start of your course?

Q3: If you received an orientation to Moodle, do you feel it was adequate?

Section 2

Q4: How would you rate the ease of use for each of the following items based on your experience with Moodle?

1) Course navigation
2) Upcoming events block
3) Uploading of files
4) Submitting of assignments
5) Discussion forum
6) Completing quizzes
7) Gradebook viewing
8) Student surveys (questionnaires)

Section 3

Q5: Think about your overall experience using Moodle in this course. How would you rate your agreement with the following statements based on your Moodle experience in general?

1) I have no problem using Moodle technology in this course.
2) I can complete my class assignments and learning activities easily.

[Instructor: I can easily organize and arrange the order of content and activities for each week.]

3) I can follow-up on my class assignments and learning activities easily.
4) I feel Moodle improves communication with my classmates.

[Instructor: I feel Moodle improves communication among my students.]

5) I feel Moodle improves communication with my instructor.
6) I feel Moodle improves my study habits.
7) I feel that doing multiple attempts for a quiz improves my understanding of the content.
8) I feel Moodle makes me spend more time studying.

[Instructor: I feel Moodle encourages my students to submit assignments on time.]

9) I feel the time I spend on Moodle improves my learning in the course.
10) Using Moodle makes me feel I am part of a community of learners in the course.

11) I feel I am learning more in the course using Moodle than if the course was taught without Moodle.

12) I would like to see Moodle used in all of my courses.

13) Using Moodle in this course makes me see the importance of using technology in teaching and learning.

[Instructor: Using Moodle enhanced how I approach the planning of my lessons.]

[Instructor: I feel using Moodle advanced my professional development in the use of technology in teaching and learning.

ANNEX C: FOCUS GROUP QUESTIONS

Students:

1. Compared to your other courses, did Moodle increase your engagement with the content of the course, or was it about the same? Please explain.
2. What tools or features of Moodle benefited your learning the most (e.g., quizzes; discussion forums; chats; wikis; etc.)?
3. Compared to other courses, did Moodle increase your interaction with your classmates? What tools or features in Moodle created the most interaction with classmates (e.g., discussion forums, chats, comments, etc.)?
4. In general, how did using Moodle impact your study habits outside the classroom (off campus)? Tell us how (e.g., studying, revising, researching, correcting mistakes, or self-reflection).
5. Did Moodle make you feel you were more responsible for your own learning (e.g., feedback for self-assessment and self-improvement; multiple attempt quizzes for self-correction; etc.)? (Did you see an improvement in your grades?)
6. Did Moodle change the quality of your interaction with the instructor? How (asking questions, getting feedback, receiving information, materials, and so on)?
7. Have you seen evidence that your academic achievement has been improving because of Moodle? Please explain.
8. All-things considered, were you satisfied using Moodle as a learning tool? What would improve the experience on the part of the instructor and the university?

Teachers

1. Compared to your other courses, has Moodle has helped you improve your teaching (pedagogical aspects)? How? (For example: giving feedback; using quizzes; posting handouts, notes, resources, news, videos, articles, or databases; updating course; keeping students motivated and on track)?
2. How has Moodle changed the way your students engage with the content of the course? How? Which Moodle tools benefited their learning the most (e.g., quizzes with instant feedback; discussion forums; chats; wikis; etc.)?
3. Compared to other courses, has Moodle increased the quality of interaction/collaboration among your students? What tools in Moodle have encouraged more interaction (e.g., discussion forums, chats, comments, etc.)?
4. Has Moodle changed the quality of your interaction with your students? How (feel more connected to them; asking questions, giving feedback, sharing information, posting lecture notes/PPTs, supplementary materials, and so on)?
5. Has the level of participation using Moodle been consistent for all students, or has it varied? Why do you think so?

6. Have you seen evidence that Moodle is improving your students' academic achievement? Please explain.
7. Has using Moodle helped you to think differently about your teaching and course design? Please say how.
8. All-things considered, how confident do you feel now in using Moodle? What should the university do to improve the experience for you and your students? (What support do you and your students need?)

ANNEX D: STUDENT SURVEY RESULTS

Figure 9. Questions, Set A

QA1: Is this your first time using Moodle in a course?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	26	7.3	7.3	7.3
	Yes	329	92.7	92.7	100
	Total	355	100	100	
QA2: Did you receive an orientation to Moodle either before or at the start of your course?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	59	16.6	16.6	16.6
	Yes	296	83.4	83.4	100
	Total	355	100	100	
QA3: If you received an orientation to Moodle, do you feel it was adequate?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	84	23.7	28.4	28.4
	Yes	212	59.7	71.6	100
	Total	296	83.4	100	
Missing	System	59	16.6		
Total		355	100		

Figure 10. Questions, Set B

		Count	Column N %
QB1: Course navigation	Very Difficult	9	2.60%
	Somewhat Difficult	56	16.50%
	Easy	228	67.10%
	Very Easy	47	13.80%
QB2: Upcoming events block	Very Difficult	9	2.90%
	Somewhat Difficult	59	18.70%
	Easy	204	64.80%
	Very Easy	43	13.70%
QB3: Uploading of files	Very Difficult	20	7.20%
	Somewhat Difficult	65	23.50%
	Easy	136	49.10%
	Very Easy	56	20.20%

QB4: Submitting of assignments	Very Difficult	10	3.70%
	Somewhat Difficult	42	15.70%
	Easy	160	59.90%
	Very Easy	55	20.60%
QB5: Discussion forum	Very Difficult	22	11.40%
	Somewhat Difficult	53	27.50%
	Easy	98	50.80%
	Very Easy	20	10.40%
QB6: Completing quizzes	Very Difficult	23	6.70%
	Somewhat Difficult	51	14.90%
	Easy	186	54.20%
	Very Easy	83	24.20%
QB7: Gradebook Viewing	Very Difficult	9	2.90%
	Somewhat Difficult	37	11.90%
	Easy	168	54.20%
	Very Easy	96	31.00%
QB8: Student Surveys (Questionnaires)	Very Difficult	9	2.80%
	Somewhat Difficult	31	9.70%
	Easy	186	57.90%
	Very Easy	95	29.60%

Figure 11. Questions, Set C

		Count	Column N %
QC1: I have no problem using Moodle technology in this course.	Strongly Disagree	26	7.30%
	Disagree	89	25.10%
	Agree	181	51.00%
	Strongly Agree	59	16.60%
QC2: I can complete my class assignments and learning activities easily.	Strongly Disagree	15	4.20%
	Disagree	103	29.00%
	Agree	174	49.00%
	Strongly Agree	63	17.70%
QC3: I can follow-up on my class assignments and learning activities easily.	Strongly Disagree	14	3.90%

	Disagree	97	27.30%
	Agree	188	53.00%
	Strongly Agree	56	15.80%
QC4: I feel Moodle improves communication with my classmates.	Strongly Disagree	29	8.20%
	Disagree	154	43.40%
	Agree	135	38.00%
	Strongly Agree	37	10.40%
QC5: I feel Moodle improves communication with my instructor.	Strongly Disagree	24	6.80%
	Disagree	101	28.50%
	Agree	182	51.30%
	Strongly Agree	48	13.50%
QC6: I feel Moodle improves my study habits.	Strongly Disagree	23	6.50%
	Disagree	91	25.60%
	Agree	189	53.20%
	Strongly Agree	52	14.60%
QC7: I feel that doing multiple attempts for a quiz improves my understanding of the content.	Strongly Disagree	12	3.40%
	Disagree	42	11.80%
	Agree	192	54.10%
	Strongly Agree	109	30.70%
QC8: I feel Moodle makes me spend more time studying.	Strongly Disagree	26	7.30%
	Disagree	113	31.80%
	Agree	176	49.60%
	Strongly Agree	40	11.30%
QC9: I feel the time I spend on Moodle improves my learning in the course.	Strongly Disagree	17	4.80%
	Disagree	72	20.30%
	Agree	210	59.20%
	Strongly Agree	56	15.80%
QC10: Using Moodle makes me feel I am part of a community of learners in the course.	Strongly Disagree	18	5.10%
	Disagree	78	22.00%
	Agree	196	55.20%
	Strongly Agree	63	17.70%

QC11: I feel I am learning more in the course using Moodle than if the course was taught without Moodle.	Strongly Disagree	24	6.80%
	Disagree	95	26.80%
	Agree	191	53.80%
	Strongly Agree	45	12.70%
QC12: I would like to see Moodle used in all of my courses.	Strongly Disagree	80	22.50%
	Disagree	98	27.60%
	Agree	109	30.70%
	Strongly Agree	68	19.20%
QC13: Using Moodle in this course makes me see the importance of using technology in teaching and learning.	Strongly Disagree	14	3.90%
	Disagree	38	10.70%
	Agree	198	55.80%
	Strongly Agree	105	29.60%

ANNEX E: INSTRUCTOR SURVEY RESULTS

Figure 12. Questions, Set A

		Count
QA1: Is this your first time using Moodle to teach a course?	No	2
	Yes	3
QA3: Did you receive an orientation to Moodle before starting your course?	No	0
	Yes	5
QA4: If you received an orientation to Moodle, do you feel it was adequate for your needs?	No	0
	Yes	5

Figure 13. Questions, Set B

	Very Difficult	Somewhat Difficult	Easy	Very Easy
QB1:Course navigation	0	0	3	2
QB2: Uploading of Files	0	0	3	2
QB3: Creating assignments	0	0	4	1
QB4: Grading of assignments	1	0	3	1
QB5: Discussion forum	0	2	3	0
QB6: Creating quizzes	0	0	4	1
QB7: Grading of open-ended questions	1	1	1	1
QB8: Gradebook viewing	0	0	3	2
QB9: Creating student surveys (Questionnaires)	0	0	4	0

Figure 14. Questions, Set C

	Strongly Disagree	Disagree	Agree	Strongly Agree
QC1: I had no problem using Moodle technology in my course.	1	0	4	0
QC2: I can easily organize and arrange the order of content and activities for each week.	0	0	4	1
QC3: I feel Moodle improves communication among my students.	0	0	4	1
QC4: I feel Moodle improves my communication with my students.	0	0	3	2
QC5: I feel Moodle improves my students' study habits.	0	0	4	1
QC6: Using Moodle makes me feel a member of a learning community with my students.	0	0	4	1

QC7: I feel my students are learning more in the course using Moodle than if the course was taught without Moodle.	0	0	3	2
QC8: I feel Moodle encourages my students to submit assignments on time.	0	0	3	2
QC9: I would like to use Moodle in all of my courses.	0	0	2	3
QC10: Using Moodle enhanced how I approach the planning of my lessons.	0	1	2	2
QC11: I feel using Moodle advanced my professional development in the use of technology in teaching and learning.	0	1	1	3